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METHOD AND SYSTEM FOR SUPPLYING PRODUCTS FROM PRE-STORED DIGITAL DATA IN RESPONSE TO DEMANDS TRANSMITTED VIA COMPUTER NETWORK

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BACKGROUND OF THE INVENTION

Technical Field

The present invention relates to a digital data duplication system that utilizes one or more computer networks to automate the process from order-taking to product delivery. More specifically, the invention permits users of CD duplication services to directly place requests into a server, which then schedules production, allocates resources, executes duplication, and sorts the products for shipment.

Description of Related Art

Before the advent of recordable digital compact disks (hereinafter "CD-Rs"), the transfer of data onto compact digital disks was a costly procedure, economically feasible only when manufacturing a large number of copies. Users whose applications required relatively few copies or required frequent data updates could not reap the benefits of this compact disk duplication technology, even though low-cost disk-readers were readily available.

The advent of CD-R was intended to allow users to record their own disks and thereby achieve significant savings. Unlike a common compact disk that has been pressed by a mold, a CD-R typically has a dye layer that is etched by a laser contained in the CD-R disk drive. Once etched, the "burned" CD-R disk is unalterable.

Several practical problems have prevented CD-R users from attaining maximal efficiency in the copy process, especially when attempting to make multiple disk copies in a short amount of time. One of the problems that typically arise in a volume copying process using CD-R writers is the necessity for direct human supervision. A person has to prepare CD-R disks for copying, remove the disks from the CD-R writer once copying is complete, and then prepare the disks for inspection to ensure no defective CD-R disks are retained in the completed set of copies. Aside from the tedium involved that may increase errors, requiring human attention in this process adds a significant labor cost that is added to the end-user price.

One solution to the human supervision problem is a programmable, automatic compact disc duplication system. That system, which includes a copy unit, a host computer and a computer software that provides a user interface, is further discussed in U.S. Pat. No. 6,141,298, incorporated herein by reference. While the system in the above patent eliminates some of the manual steps that creates inefficiency, it still leaves many steps to be handled by operators.

SUMMARY

The present invention relates to a method and system of taking customer requests and writing the requested digital data onto various digital recording media, such as CD-ROMs, CDs, mini-CDs, or DVDs. Using this method, a customer can request any quantity of a specific CD, mini-CD, or DVD through an electronic commerce transaction system or a website and have a server automatically process the request so that it is ready for delivery. Upon order entry, the customer interface website first sends an electronic mail (e-mail) to a CD Writer Server. The e-mail triggers the CD Writer Server to update a log of requests and send signals to one or more printing devices that prepare address labels for delivery. Once the log is updated, the CD Writer

Server schedules the requests based on estimated process time, availability of the appropriate output device, suitability of particular devices for handling a particular request, among other characteristics. Information on process time is obtained from an internal archive of the digital data used to produce the ordered CDs. Likewise, the information concerning the availability of each output device in the system is found in internal resource files. When scheduling is complete, the CD Writer Server converts the e-mail requests into machine language and sends write commands to designated output devices.

One important object of the present invention is to cost-effectively duplicate CDs using CD writers in response to requests received from remote customers. The present invention removes the inefficiency associated with human supervision, and eliminates the need for inventory.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic depiction of the three modules comprising a CD Writer Server.

FIG. 2 is a block diagram depicting the process flow from order receipt to production.

FIG. 3 is a schematic depiction of the functions of the Log Manager.

FIG. 4 is a schematic depiction of the functions of CD Writer Control.

DETAILED DESCRIPTION

The present method and system relate to conducting a business that supplies any type of written or printed material, such as invitations, books, cards, and similar materials that can be mechanically produced from an archive of digital information. In one embodiment, the present invention is adapted to produce various digital recording media, such as CD-ROMs, CDs, mini-CDs, and DVDs (hereinafter collectively referred to as CDs). The invention is implemented through a computer system herein referred to as CD Writer Server. CD Writer Server **100** processes customer requests by using three

modules that work together: Log Manager **200**, Resource Manager **300**, and CD Writer Control **400** (see FIG. 1). A "module," as used herein, refers to the functionality and not the configuration of components.

The CD Writer Server **100** typically resides on an e-mail server because the CD Writer Server commonly communicates with the customer interface **10** via e-mails. The order fulfillment process is triggered when a customer enters a request through a customer interface **10**. A customer interface includes but is not limited to a website, a web server, an electronic commerce transaction system, a customized start page, or an e-mail subsystem. At the interface, the customer is prompted to provide 1) the content(s) he wants duplicated, for example identifiers of songs, movies, or software, 2) the desired quantity, 3) personal information such as the name, address, and phone number of the customer, 4) the desired shipping method, 5) the due date, and 6) a payment or a method of payment, such as a credit card number, among other information. After the request has been entered and the CD Writer Server **100** has scheduled the request, the customer may be able to see an estimated delivery date at the interface **10**.

The present system manages payment at the customer interface **10**, either through an e-commerce transaction system involving a credit card number, or through an account number to which charges can be made. Managing payment through an e-commerce system significantly reduces the amount of human supervision that is required.

As shown in FIG. 2, the CD Writer Server **100** module that first receives an e-mail order from the customer interface is Log Manager **200**. FIG. 3 shows that upon receiving an e-mail, Log Manager **200** first interprets it **210** and extracts certain information, including but not limited to the mailing address. Then, Log Manager **200** time-stamps each incoming e-mail **220** and lines it up in the order of receipt **230**, creating a log that CD Writer Control **400** can eventually retrieve and process. In addition, Log Manager **200** sends the extracted mailing address information **240** to an address label printer **600**.

The printer **600** is optionally attached to the CD Writer Server **100**. Log Manager **200** repeats **250** the process with each incoming e-mail request, updating the log with each request.

After Log Manager updates the log, CD Writer Control **400** retrieves the log and examines it **410** in conjunction with the information stored in Resource Manager to schedule the production of CDs. The information CD Writer Control retrieves from Log Manager **200** pertains to the specifics of a request, such as the order quantity and the requested content. In contrast, the information stored in Resource Manager **300** pertains to hardware configuration and digital data that represent contents that can be transferred to a blank medium. As FIG. 2 shows, Resource Manager maintains two types of files: a set of resource files **310**, one file for each of the output devices controlled by CD Writer Server, and an archive **320** of all the sounds, images, and characters used to execute the duplication requests.

In one embodiment, there are as many resource files **310** in Resource Manager **300** as there are output devices (hereinafter CD Writers) **500**. For example, Resource Manager **300** shown in FIG. 2 stores *N* resource files **310** because there are *N* CD Writers **500**. Each resource file contains the name and the IP address of each CD Writer **500**, the number of drives and printers in each of those machines, and the number of blank CD-Rs remaining in each machine, among other information. Moreover, the resource file **310** keeps track of which data from its archive **320** has been copied to the internal cache **520** of each CD Writer **500** and how much cache space remains in each machine. The latter information becomes important when some data needs to be purged in order to download new data. As FIG. 2 shows, Resource Manager **300** and CD Writer Control **400** maintain close communication **330** so that every time CD Writer Control **400** sends a write command **440** to one of the CD Writers **500**, Resource Manager **300** can update the resource file **310** for that CD Writer.

As mentioned above, Resource Manager **300** also stores an archive **320** of all the sounds, images, and characters used to produce the requested CDs. The archive can be internally indexed by part numbers, each part number being associated with a path name. In one, the hard drive of Resource Manager **300** was designed to hold at least 1,000 CD contents along with corresponding graphics, which are to be physically printed on the CDs (the number of contents the archive can hold depends on the amount of data that each content corresponds to). In order to change or update the contents of the archive, an operator would have to delete some of the existing data and download new data from a network or a digital storage medium.

CD Writer Control **400** retrieves information from both Log Manager **200** and Resource Manager **300** to schedule production for each CD Writer **500** connected to the system. In order to optimize production, CD Writer Control **400** must first calculate the process time for each order **412**. This calculation is performed by first reading the title of the requested songs or movies from the order log and looking up the size of those songs or movies in the Resource Manager archive. Then, CD Writer Control **400** can schedule the requests according to whatever criteria that best suits the business (i.e., it can be programmed). For example, it can schedule the duplication jobs in the order that the requests were received, to ensure that between two requests with approximately equal process times, the request that was received first will be processed first. Alternatively, it can prioritize the request with a closer due date or an order marked "high priority." Furthermore, if there are multiple orders requesting the same content, CD Writer Control **400** can group those orders so that they can be produced together **414** (but the mailing address labels would be different for each order). Other factors may only be taken into account in the scheduling algorithm.

Since there are different types of CD Writers **500** (for example, CD Writers for DVDs and CD Writers for mini-CDs) with different cache **520** contents and varying numbers of drives **510**, scheduling involves careful selection of a CD Writer for each job. CD Writer Control **400** selects (**416**,

418) a CD Writer **500** based on the hardware configuration data stored in Resource Manager's resource files **310**. CD Writer Control **400** would send a job to the next available CD Writer **500** of the appropriate type that already has the requested content in its cache **520**. For optimal production, as many machines as possible would be processing orders concurrently.

Once scheduling is complete, CD Writer Control tells the designated CD Writer to begin the duplication process by sending a "write" command in the appropriate machine language **440**. However, before sending the "write" command, CD Writer Control **400** must check to make sure there are enough blank CD-Rs **540** loaded in the particular machine, as shown in FIG. 4. CD-R, as used herein, refers to any kind of medium onto which data can be fixed, printed, embodied, or stored, and from which the information fixed, printed, embodied, or stored therein can be perceived, reproduced, used, or otherwise communicated, either directly or indirectly with the aid of a device. Each CD Writer can be designed to hold as many number of CD-Rs as is practical. If there is an insufficient number of blank CD-Rs remaining, CD Writer Control notifies the operator with a short message **448**. If there are enough blank CD-Rs, CD Writer Control will send the write command for the proper number of CDs **440**. Note that the maximum number of CDs that can be written and printed with one "write" command is equal to the number of drives in the CD Writer that is processing the order (shown as *n* in FIG. 4). Thus, CD Writer Control repeatedly sends **446** a "write" command to the designated machine until the requested number of CDs have been produced. When a request is fulfilled, CD Writer Control **400** proceeds to the next request scheduled for the particular CD Writer.

In the event that no CD Writer of the appropriate type contains the requested data in its cache, CD Writer Control must check whether there is enough cache space left in the machine and download **432** the necessary data onto that machine from the Resource Manager internal archive. Only after downloading is complete can the CD Writer Control send its "write" command, which directs the CD Writers to transfer a specific subset of data

from their cache to the blank CD-Rs. In one embodiment, each CD Writer is designed to hold up to about 200 CD images and printer graphics (depending on the size of the images).

Writing a CD entails not only transferring digital data from the cache **520** to the blank CD-Rs **540**, but also printing certain graphics on the surface of the mediums. Thus, each CD Writer must be equipped with at least one printing device **530**.

While the present invention is illustrated with particular embodiments, it is not intended that the scope of the invention be limited to the specific and preferred embodiments illustrated and described.